

Transportation Assistive Device for the Elderly Based on Service Design

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Abstract

Commercial products specially designed for the elderly have assumption of user disability and focus on assistive tools design. However, recent studies show aged people gradually stay healthy condition because of modern advanced medical technology and service. There so-called “platinum society” that describes a group of aged people live in a community where they have to take care of themselves under healthy condition. To respond to above situation, this study applies service design model to explore daily life requirement of the elderly and proposes a new transportation assistive device design located aside the bus station. From empathy map analysis, point of view definition, requirement-and-function deployment, to service model construction, real daily life activity and movement of the elderly are collected and analyzed. A participative design approach is applied to involve senior citizen participation that is helpful to retrieve their intangible needs. In this proposed design, it includes an information interface and an exercise assistive device for the elderly to use during the waiting period when they stay at the bus station. It provides required information for transportation purpose as well as simple exercise movement that make it form an area of social connection. Instead of boring waiting time wasted at the station, it enhances interaction between the elderly through uncomplicated stretch movement and conversation. A scaled prototype is implemented to simulate and test the scenario and interview is executed to collect feedback from the elderly. Ongoing progress show a feasible application can be achieved by integrating with current environment.

Keywords: assistive device, transportation, the elderly, service design

People live longer and healthier than ever before thanks to the continuous technology development. It's more common that the ratio of senior citizens increasingly expanding in a community or country all over the world. This situation will become more obvious in some countries where the birth rate comparatively reduces in an astonishing way. Taiwan, for example, recently faces the above problem of population moving from aging to aged society. Product and environment design targeted at groups of the elderly therefore should be paid more attention since the senior citizen's requirement are totally different from those of young people. Commercial products and systems especially designed for the elderly usually have assumption of user disability and focus on assistive requirement. In terms of user need, it has been switched from "health maintenance" to "living quality improvement" and accorded with the truth that aged people gradually stay healthy condition due to advanced medical technology and service. Specific consideration of product and system development and design for a group of healthy senior citizens live in a community is imperative to provide them with safe and high quality living environment. Issue of food, clothing, residence, transportation, education and entertainment are all related to wellness and well-being for the elderly. In addition to independent daily life in a house or apartment, an outer social network is another important factor for them to enhance the quality of life. A convenient and comfortable transportation approach for the elderly is required to extend their connection with the rest of the world. In Taiwan, taking a bus is widely adopted by the elderly as a transportation approach to reach further connection either physically or psychologically. This study intends to develop a transportation assistive device for this specific group users by using the service design approach. Starting from analyzing user requirement, the proposed design provides required information for transportation purpose as well as simple exercise movement that make it form an area of social connection. A scaled prototype is implemented to simulate and test the scenario. Detailed development process is described in the following sessions.

Literature Review

Many countries endeavor to find solutions for the falling birthrate and demographic aging. In consideration of the increasing number of senior citizens in our society, either healthy or disabled, it is imperative to recognize the real need of this group in relation to medical and non-medical care. Theoretically, the elderly use medical care more often than others (Berkelmans et al., 2010). It is understandable that the elderly can maintain wellness and well-being if their functional failure are minimized during hospitalization (Kim et al., 2017); a senior-friendly hospital environment is required, in other words. Also, housing environment is absolutely relevant to the functional capacity of the elderly. There will be negative health consequence for them if the housing environments cause weak performance of daily activities and reduced participation in social life (Granbom et al., 2016). Accessibility problems for the elderly living in ordinary housing are quite noticeable in areas such as entrance and kitchen.

Therefore, product and system development and design for the elderly have been largely paid attention to the above concern (Skrzek et al., 2015). Advanced technology like robots and mobile service are widely used to assist with the in-home care of the elderly and people with numerous types of disabilities. The introduction of pervasive and ubiquitous system become increasingly embedded in artifacts and environment to provide important health care and social service (Maglogiannis et al., 2014). However, since aged people gradually stay healthy condition because of advanced medical service, non-medical care and service become more pressing for them to improve their life quality. Consideration of transportation and entertainment for the elderly who have no problem with walking become important to enhance their life independence. Recent research works present many examples to respond to this emergent trend. Manzi et al. (2017) proposed a cloud robotic system to extend the capability for interaction and support the elderly during daily activities such as participation in social events, to enhance their independent living. The elderly even can keep pace with the current era by using a variety of technical equipment and smart devices through learning (Vacek and Rybenska, 2016). Using communication and visualization technologies, which include Augmented Reality (AR), Virtual Reality (VR) and QR codes, and the elderly can improve their social and personal well-being (Fernandez et al., 2017). Hung and Sunder (2016) investigated why senior citizens use Facebook and how they participate in specific activities on Facebook to meet their needs. Their result found four interesting motivations for using Facebook: social bonding, social bridging, curiosity and responding to family member requests. Moreover, a case study in Taiwan shows the elderly can use scientific knowledge to solve problems by designing toys (Chen et al., 2013). The above research works greatly indicate the trend and need of providing products and services, in addition to medical service, especially for the healthy elderly to improve their independent living with better quality.

Research Methods

Among the basic living requirements, transportation and entertainment are two of the most essential factors for the elderly to improve their social connection with outer world when they are in an independent living situation. This study aims to develop a product/service for the elderly based on their daily requirement using service design model. Several design methods are applied to identify design requirement before the ideation of this project – rapid ethnography, empathy map, point-of-view analysis and customer journey definition. The activity of taking a bus is selected as the transportation event since it has important role of social connection.

Ethnography is suitable for the project where the intent is to provide an in-depth description of everyday life. This study visited five subjects (ages 65-75) and participate in their natural

habitat and witness specific activities related to the event of “taking a bus”. These observation and records give us an insight into the problems and requirements of the transportation activity (taking a bus) for the elderly. Six incidents are recorded during the subject observation phase:

1. Most of them feel anxious under unfamiliar environment
2. Queue jumping behavior is more common than young people have
3. Instead of IT technology, the elderly usually ask about bus route orally
4. Literal description are normally ignored by the elderly
5. Offering seat to the elderly on the bus is common
6. Few passenger will actively talk to the elderly regarding problem solving

In terms of providing better transportation environment for the elderly, four user problems are identified based on the above observation: information readability is poor at the bus stop, they are filled with anxiety about unfamiliar environment, too many uncertainty regarding bus route and schedule, and improper ergonomics on the bus and around the bus stop. To narrow down and refine design problem, one of the subject is interviewed and requested to write down specific activities and emotion. Furthermore, an empathy map is generated to analyze the unsubstantial requirement (Table 1).

Table 1: Empathy map

Do	Say
1. Ask someone or bus driver 2. Walk around 3. Call someone by phone	1. Question about route and schedule
Feel	Think
1. Anxious 2. Boring 3. Time-wasting	1. Useless information 2. Get on bus quickly

Several potential design directions are then created by POV (point-of-view) analysis as follows:

1. Providing distinct information
 - How might we reduce the ambiguity of transportation information?
 - How might we reduce the anxiety due to environment unfamiliarity?
2. Improving transportation efficiency
 - How might we reduce the chance of taking wrong bus route?
 - How might we reduce the time waste because of doubtful information?
3. Enhancing social connection
 - How might we create chance of social interaction?

- How might we increase pleasure emotion during transportation event?

Scenario of taking a bus for the elderly is described as a persona and a customer journey based on the character retrieved from the subject we interviewed. A kiosk installed around the bus stop is initially determined as the target device. Nine touch points are especially defined as service functions in terms of relation between activity and device (Table 2):

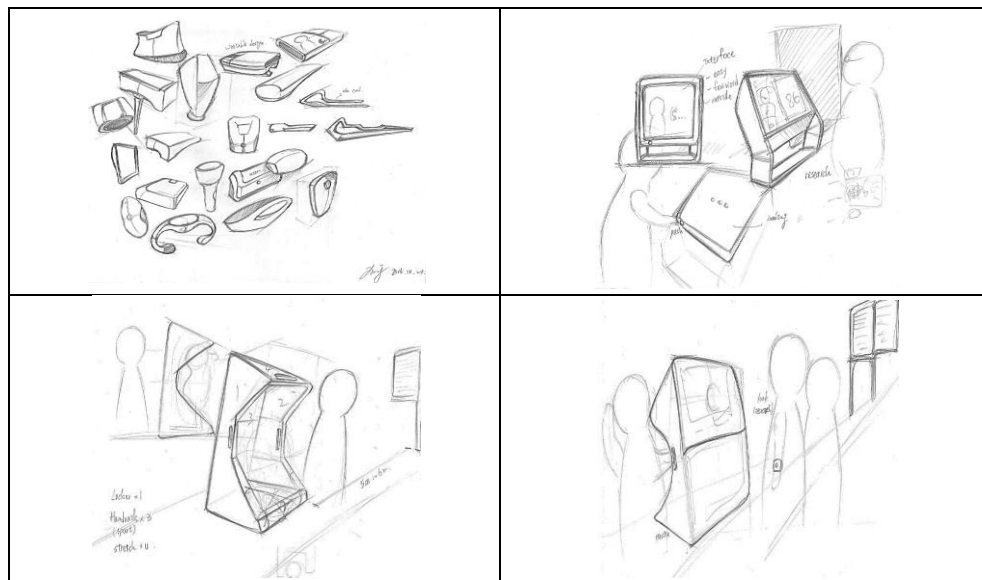
Table 2: Service touch points defined

Activity	Responding device area
Screen displays route information	Kiosk interface
Baggage storage	Kiosk storage at back side
Touch screen	Kiosk interface
Select destination by different items	Kiosk interface
Provide commercial information	Kiosk interface
Choose bus route	Kiosk interface
Display accurate selection	Kiosk interface
Stretch movement	Kiosk space at back side
Display bus coming information	Kiosk interface

Discussion

Ideation process is then triggered to develop a kiosk installed around the bus stop where scenarios are simulated to satisfy the result of POV analysis. Two requirements of taking a bus for the elderly are emphasized: transportation purpose and social connection. Initial and modified sketches are shown in Table 3.

Table 3: Sketches at different phases



The final version design of this kiosk is installed beside the bus stop. It provides passengers with required information about bus route and schedule. Handle bars are embedded at both sides of the kiosk whose back side has a space for the elderly to exercise simply and chat with

other passengers. The concept is to decrease the anxiety caused by the uncertainty and unfamiliarity through operating kiosk interface in an effortless manner and killing time by simple exercise at the back of the kiosk. Table 4, 5 and 6 show the interface example, the process of mock-up and final prototyping after the design review respectively.

Table 4: Interface examples

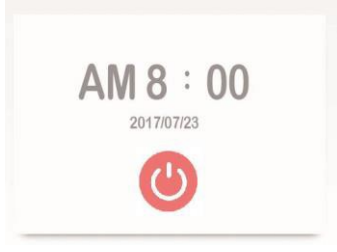
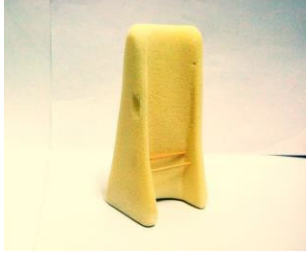
	
	

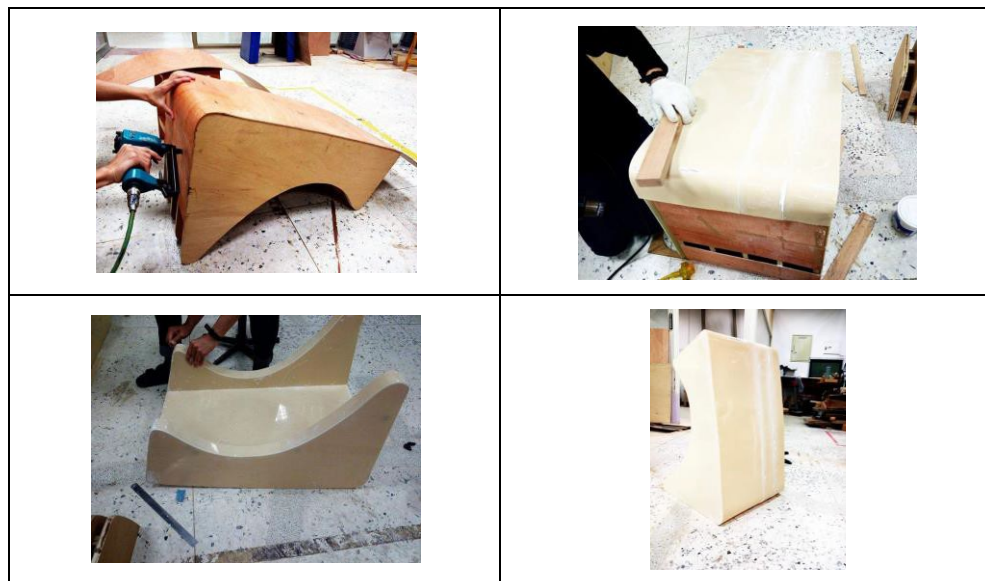
Table 5: Mock-ups

Mock-ups are used as a base of design review through the inclusive approach. Subjects are explained about the design concept and guided with defined scenario of using the kiosk. To respond to the questions and suggestions received from the elderly subjects, design modification is processed and focused on the following issues:

1. Stretch area is more suitable at the back side to reduce embarrassment.
2. Temporary baggage storage is necessary for the elderly.
3. Add the item selection based on “direction”.

Table 6: Final scaled prototype



Conclusion

A computer simulation indicating the installation of the proposed kiosk design, a transportation assistive device for the elderly, is shown in Figure 1. It intends to provide a helpful device installed beside the bus stop for the counter stereotype of the elderly who actively go out to expand their social connection. A comfortable and familiar atmosphere accompanied with clear information interface are the major concern of this kiosk design. The body stretch area at the back side of the kiosk offers the elderly passenger a place for simply exercising when they are waiting for the bus to arrive. It attracts the elderly to chat with others without embarrassment by stretching their body naturally. At the front side of the kiosk, a concise interface is proposed to reduce the information ambiguity. The study applies the service design models to retrieve user-centered design requirement. An inclusive design approach including rapid ethnography and design review shows that the study proposes another perspective to deal with issue of enhancing the life qualify for the elderly.

Figure 1: Computer simulation of the proposed kiosk



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